

## Section 5.3 – Square Root Functions and Inequalities

I can identify the domain and range of a square root function.

I can graph a square root function using translations, reflections, and stretches.

Parent Function:  $f(x) = \sqrt{x}$

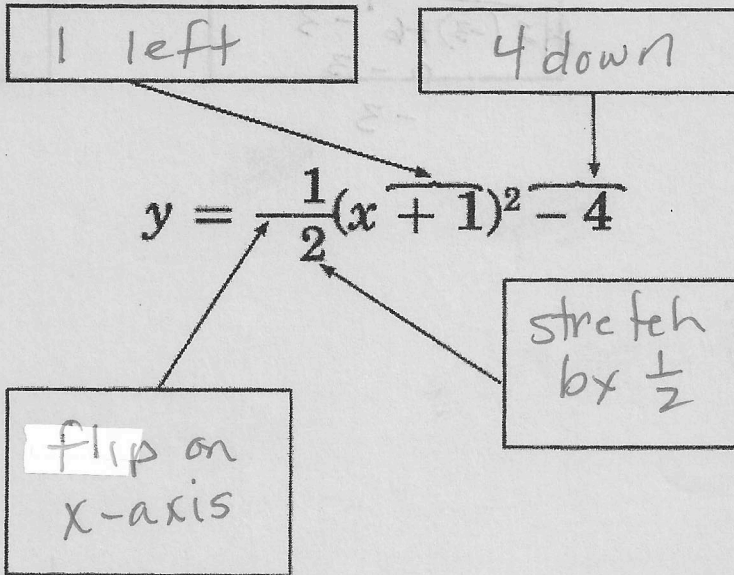
Domain:  $x \geq 0$  or  $[0, \infty)$

Range:  $y \geq 0$  or  $[0, \infty)$

Starting Point:  $(0, 0)$

### Active Vocabulary

**Review Vocabulary** Describe how each component of this quadratic function transforms the graph of the parent quadratic function  $y = x^2$ . (Lesson 4-7)



### Transformations of Square Root Functions:

$$f(x) = a\sqrt{x-h} + k$$

**h-** Horizontal Translation

$h$  units right  
 $h$  is positive

**k-**

Vertical Translation

$k$  units up ( $k$  is pos)  
 $k$  units down ( $k$  is neg)

**a-**

Orientation & Shape

if  $a < 0$ ,  
graph is reflected on x-axis

Domain:  $x \geq h$

$|h|$  units left  
if  $h$  is negative

Range:

if  $a > 0$ , then

$$y \geq k$$

if  $a < 0$ , then

$$y \leq k$$

if  $|a| > 1$ ,

stretched vertically

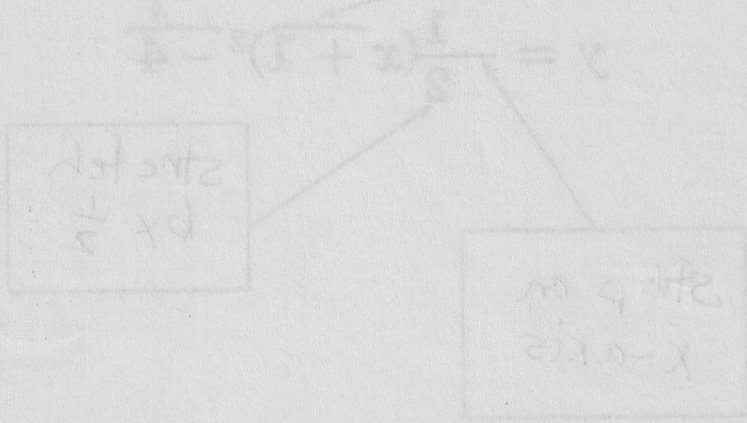
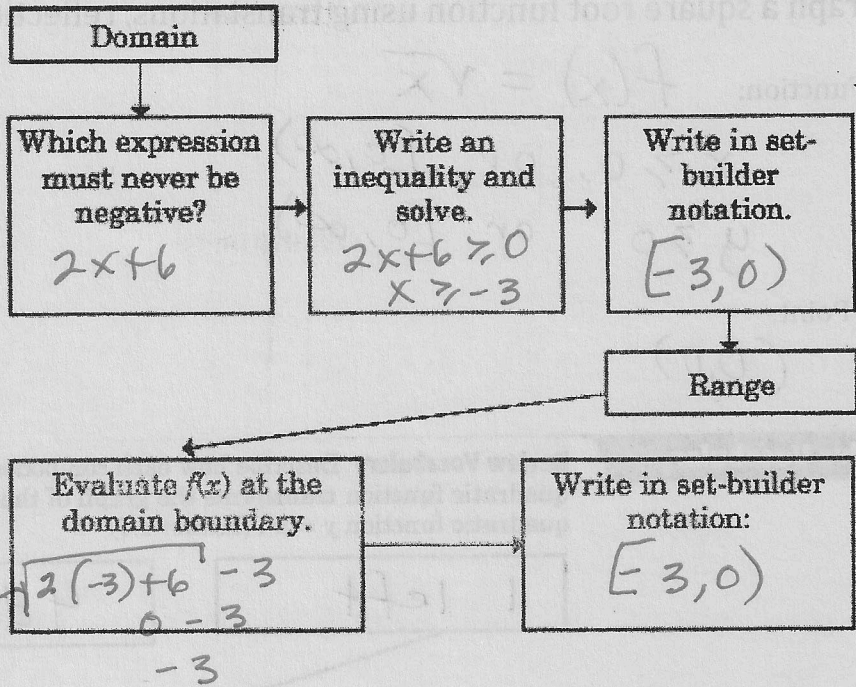
if  $0 < |a| < 1$ ,

compressed vertically

# Square Root Functions

Identify the domain and range for the function

$$f(x) = \sqrt{2x + 6} - 3.$$



Vertical Translation  
K shifts up (K pos)  
K shifts down (K neg)

Horizontal Translation  
H shifts right  
H shifts left

Vertical Stretching  
Vertical Compression

Vertical Reflection

Domain:  $x \leq k$

Range:  $y \geq k$

$f(x) \leq k$

$f(x) \geq k$

If  $H$  is negative  
H shifts left

If  $H$  is positive  
H shifts right

Name: \_\_\_\_\_

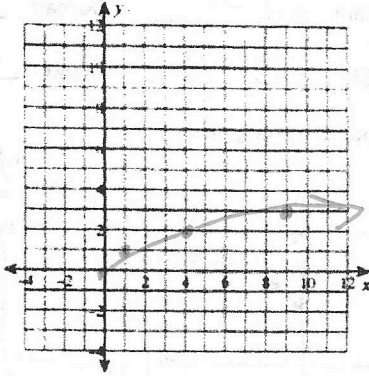
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### 5.3 Square Root Functions

Make an  $x - y$  table and graph each of the following functions

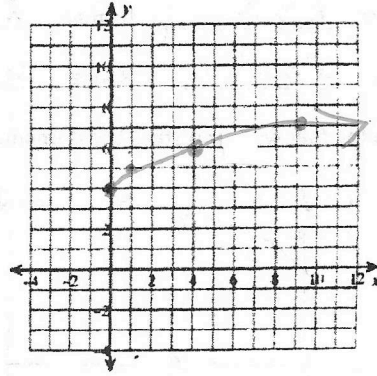
1)  $y = \sqrt{x}$

x	y
0	0
4	2
9	3



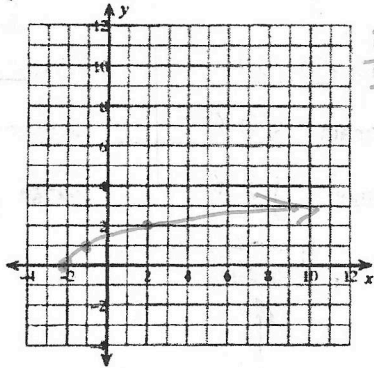
2)  $y = \sqrt{x} + 4$

x	y
0	4
4	5
9	6



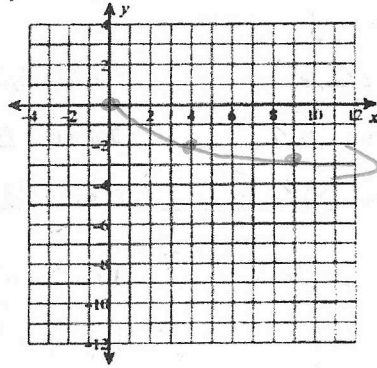
3)  $y = \sqrt{x} + 2$

x	y
-2	0
-1	1
2	2



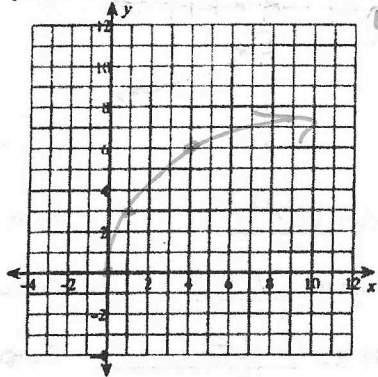
4)  $y = -\sqrt{x}$

x	y
0	0
4	-2
9	-3



5)  $y = 3\sqrt{x}$

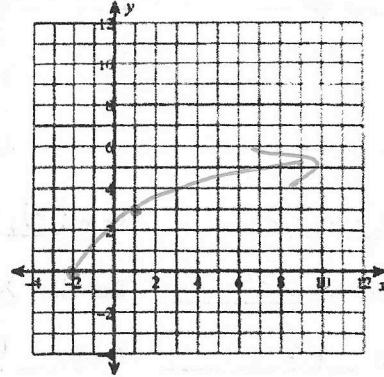
x	y
0	0
1	3
4	6



6)  $y = \sqrt{3x+6}$

$3x+6 \geq 0$      $3x \geq -6$   
 $x \geq -2$

x	y
-2	0
1	3



Name \_\_\_\_\_ Date \_\_\_\_\_ Period \_\_\_\_\_

Graphing Square Root and Cube Root Functions

State the domain and range of each.

- |                                      |                                       |                                       |                                      |
|--------------------------------------|---------------------------------------|---------------------------------------|--------------------------------------|
| 1. $y = \sqrt{x-2} + 5$              | 2. $y = \sqrt{x+2} - 3$               | 3. $y = \sqrt{x+1} - 4$               | 4. $y = \sqrt{x-1} - 1$              |
| Domain: <u><math>x \geq 2</math></u> | Domain: <u><math>x \geq -2</math></u> | Domain: <u><math>x \geq -1</math></u> | Domain: <u><math>x \geq 1</math></u> |
| Range: <u><math>y \geq 5</math></u>  | Range: <u><math>y \geq -3</math></u>  | Range: <u><math>y \geq -4</math></u>  | Range: <u><math>y \geq -1</math></u> |

Graph the following and state the domain, range, and the end point/turning point.

- |                     |                     |                       |                          |
|---------------------|---------------------|-----------------------|--------------------------|
| 5. $y = \sqrt{x+5}$ | 6. $y = \sqrt{x-2}$ | 7. $y = 3 + \sqrt{x}$ | 8. $y = 4\sqrt{x-2} - 1$ |
|                     |                     |                       |                          |

- |                                       |                                      |                                      |              |
|---------------------------------------|--------------------------------------|--------------------------------------|--------------|
| Point <u>(-5, 0)</u>                  | Point <u>(2, 0)</u>                  | Point <u>(0, 3)</u>                  | Point _____  |
| Domain: <u><math>x \geq -5</math></u> | Domain: <u><math>x \geq 2</math></u> | Domain: <u><math>x \geq 0</math></u> | Domain _____ |
| Range: <u><math>y \geq 0</math></u>   | Range: <u><math>y \geq 0</math></u>  | Range: <u><math>y \geq 3</math></u>  | Range _____  |

- |                         |                                     |                      |                          |
|-------------------------|-------------------------------------|----------------------|--------------------------|
| 9. $y = \sqrt{x+4} + 1$ | 10. $y = \frac{1}{2}\sqrt{x+1} + 4$ | 11. $y = -2\sqrt{x}$ | 12. $y = \sqrt{x-4} - 1$ |
|                         |                                     |                      |                          |

- |                                       |                                       |                                      |                                      |
|---------------------------------------|---------------------------------------|--------------------------------------|--------------------------------------|
| Point <u>(-4, 1)</u>                  | Point <u>(-1, 4)</u>                  | Point <u>(0, 0)</u>                  | Point <u>(4, -1)</u>                 |
| Domain: <u><math>x \geq -4</math></u> | Domain: <u><math>x \geq -1</math></u> | Domain: <u><math>x \geq 0</math></u> | Domain: <u><math>x \geq 4</math></u> |
| Range: <u><math>y \geq 1</math></u>   | Range: <u><math>y \geq 4</math></u>   | Range: <u><math>y \leq 0</math></u>  | Range: <u><math>y \geq -1</math></u> |